Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.

SHOUT
SHARE
IT

BULLETIN OF THE
U.S. DEPARTMENT OF AGRICULTURE

No. 110

Contribution from the Bureau of Animal Industry, A. D. Melvin, Chief.
August 8, 1914.

FATTENING CATTLE IN ALABAMA.

By Dan T. Gray, *Formerly Professor of Animal Industry, Alabama Polytechnic Institute*, and W. F. Ward, *Animal Husbandry Division, Bureau of Animal Industry.*

I. Wintering Steers Preparatory to Summer Fattening on Pasture.
II. Fattening Steers on Pasture in Alabama.
III. The Influence of Winter Feeding upon Gains Made the Following Summer.

INTRODUCTION.

The investigations reported in the following pages are a continuation of the cooperative work started in 1904 between the Bureau of Animal Industry and the Alabama Experiment Station. Previous results will be found recorded in Bureau of Animal Industry Bulletins 103, 131, 147, and 159, and Department of Agriculture Bulletin 73.

The map (fig. 1) shows the general location of the farms in Alabama where the experiments were conducted, also the principal markets which are accessible to cattlemen from various sections of the South. The shaded lines indicate the area where the climatic conditions and the pasture grasses are relatively similar to those of western Alabama. This shaded portion represents the area to which the results of the experiments outlined in Parts I and III of this bulletin are applicable.

The cattle from Texas, northern Louisiana, Arkansas, western Mississippi, and Tennessee usually go to the Fort Worth, St. Louis, or Kansas City market. Those of eastern Mississippi and Alabama may be sent to either the St. Louis or the New Orleans market; the cattle of southern portions of Mississippi, Alabama, Georgia, and Florida are usually sent to the New Orleans market, or to Tampa, Fla., for export to Cuba; while the cattle of the Carolinas, northern Georgia,

Note.—This bulletin is a report of progress on experiments begun in 1904 in cooperation with the Alabama Agricultural Experiment Station and reported in B. A. I. Bulletins Nos. 103, 131, 147, and 159, and department Bulletin No. 73, and gives the results of work done during the last and two preceding years. It is applicable to those portions of the South where the climatic conditions and pasture grasses are similar to those in that section of the State where the tests were made.

43865°—14——1

eastern Tennessee, and Virginia are usually shipped to Richmond, Washington, Baltimore, or Jersey City to be slaughtered. While there are no large markets, except Fort Worth, located in the South, it is possible for many of the cattlemen to ship their cattle to one of the better markets. It is also probable that with the development of the live stock industry of the South the southern markets will grow, and transportation facilities, which are poor at the present time, may increase in efficiency. If it were possible to get as good train service for cattle in the South as it is in the West, there is no portion of the

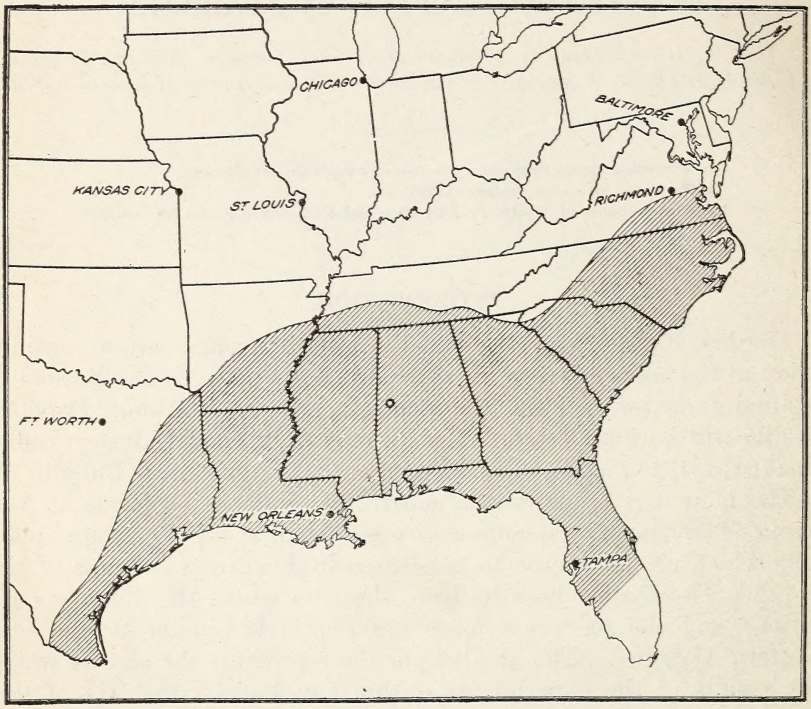

FIG. 1.—The shaded area represents the portion of the United States to which the results secured in the Alabama feeding experiments are applicable. The dark circle in Alabama shows the approximate location of the test farm. The location of the various cattle markets to which southern cattle are shipped are shown.

South from which cattle could not be shipped with relative ease to a good market.

Of the various problems which arise concerning the care of cattle on the farm, one of the most frequent deals with the methods of carrying the stock cattle through the winter. As a rule the growing of cattle through the grazing season gives little trouble, but the farmer is often puzzled as to the method to follow in wintering the stock. This is especially true during years when not enough roughage has been harvested to feed all the cattle. At times good steers have

been sold at sacrifice prices in the fall under such conditions, when, if they could have been wintered there would have been an abundance of grass to fatten them the following summer.

The buying of commercial feeds to use for wintering stock cattle has been practiced to a certain extent, though it is far more common in the South to turn the cattle loose on the range and let them take care of themselves the best they can during the winter. Cattle treated in this manner always become very thin before spring, and some losses occur. A few of the better stockmen, who handle their mature cattle in this manner, sometimes drive up the thinnest of the cattle during the latter part of the winter and give them some feed until grass comes in the spring.

I. WINTERING STEERS PREPARATORY TO SUMMER FATTENING ON PASTURE.

This is the third in the series of experiments to determine the most profitable methods of wintering mature steers in the South, which were to be fattened on pasture the following summer, and to study the effects of the various methods of wintering on the rapidity of the gains made by the steers during the subsequent summer fattening. The results secured in the two previous years have been reported in former bulletins.[1] The results of the work during the third winter (1909–1910) are given herewith.

PLAN OF THE WORK.

The same general plan that had been followed during the two previous years was adhered to. The cattle were bought in the fall and held in the pasture until the grass was exhausted. They were then turned into the cornfields and allowed to remain until the work was started on December 8, 1909. The tests were made on the farm of Mr. O. E. Cobb, of Sumter County, Ala., and were under the direct supervision of Mr. H. J. Chatterton, who was stationed upon the farm and devoted his entire time to the work.

At the close of the winter work the steers were redivided into groups and used in the summer fattening work.

CATTLE USED.

The steers used in these tests were 2 and 3 year old grades of the Hereford, Shorthorn, Aberdeen-Angus, and Red Polled breeds. They were poorer in quality and smaller in size than the steers which had been used in the two previous tests. Many of them were only half bred, while some even carried a predominance of scrub blood. They would have classed as common to fair stockers on the market. They were bought principally of neighboring farmers in western Alabama. All were cattle which had been infested with the cattle tick ever since they were calves.

CHARACTER OF THE WINTER RANGE AND PRICES OF THE FEEDS USED.

The cattle were kept in inclosed fields which had been used for growing cotton and corn. The range consisted of the above-mentioned fields and some waste land upon which had grown the native

[1] See Bureau of Animal Industry Bulletins 131 and 159.

grasses. Crab grass and some Johnson grass had grown up between the rows and furnished some grazing. The corn had been snapped from the stalk and the entire stalks were left in the field. No canebrakes were available, and the cattle which were not fed had to depend entirely upon the stalks in the cultivated fields and the native grasses.

The cottonseed meal fed to lot 2 was of the same grade as that in previous years and contained about 38 per cent protein. The hay used for lot 4 consisted of very coarse Johnson grass mixed with weeds and was damaged to such an extent that it could not have been sold at all. It could not be cut at the proper stage because of a prolonged rainy spell. The grass had to be cut, however, to permit the next cutting to grow off, and instead of using the coarse grass for filling ditches, as is often done in similar cases, the hay was raked and stacked in a long rick just outside the hayfield, next to a field in which the steers were to be wintered.

The prices placed upon the feeds at the time of the test were as follows, these being the current prices of hulls and meal at the time the experiment was made:

Cottonseed meal	per ton..	$26
Cottonseed hulls	per ton..	6
Damaged hay	per ton..	5

The duplication of the test of the previous year with cotton seed to supplement the range could not be carried out as the price of this feed had increased from $14 per ton to over $20 per ton, and at such prices the seed could not be profitably used when cottonseed meal sold for but a few dollars more per ton.

No price was placed upon the stalk fields and the open range. No revenue would have been secured from them if they had not been grazed by the cattle.

METHOD OF FEEDING AND HANDLING THE CATTLE.

The cattle ran in the inclosed fields at all times and were not penned at any time of the day or night. No shelter was provided for them, but during bad weather they sought natural shelters, consisting of plum thickets, rows of hedge trees, and hillside nooks, which gave protection from the winds. The feed was placed in feed troughs and racks, which had skids in order that they might be pulled from place to place. By this method the manure was dropped in different places and the animals did not have to stand in the mud while eating. The troughs were placed as near the feed barn as practicable, in order to obviate hauling the feed long distances. The cattle were fed once each day, just before sundown. Salt was given the animals at feeding time to induce them to come the more readily

to their feed. No salt was given for several days previous to each weigh day.

All the animals were dehorned, tagged, divided into groups which were uniform in quality and size, and each one was weighed on two consecutive days at the beginning of the test. Thereafter each group was weighed as a whole every 28 days until the close of the test, at which time each steer was again weighed.

The steers of lot 4, which received the damaged hay in addition to the range, were not fed upon the same farm as the other steers. The hay was 1½ miles from the scales, and it was found after the test had been in progress for some time that the hay could not be weighed out and the refuse weighed back each day, so accurate feed records were not kept for this lot. The weight records of these steers are correct, however, and are shown herein; not that any value is placed upon them as far as the winter work is concerned, but in order that the gains made by these steers the following summer may be studied and compared with the gains made during the summer by the steers of the other winter lots. This phase of the work will be discussed in full in another portion of this bulletin.

As soon as all the cotton had been picked the steers were divided into groups, tagged, weighed, and started on feed. The test began December 8, 1909, and continued until March 9, 1910, at which time melilotus and grass had begun to grow enough to furnish grazing. Melilotus grows luxuriantly throughout that portion of the State and furnishes good early grazing.

RESULTS OF THE WINTER FEEDING.

The winter of 1909–10 was a severe one, it being much colder than the average winter in Sumter County, with a great deal of rain and one hard sleet during December, which covered everything with ice for two days. Cold rains and winds made it hard upon the steers. During January the weather was cold, but there was not much rain. Light freezes occurred throughout the month. The month of February was about the average of several years. There were a number of cold nights, with freezes and some rains, but the weather was not as severe as during the first part of the winter. The feed on the range however, was almost exhausted, while during December it was plentiful.

The following table shows the rations fed, the number of steers in each lot, the average weight per steer at the beginning and the end of the test, the total gain, and the average daily gain per steer for the 91-day period.

TABLE 1.—*Results of wintering steers in 1909–10, December 8 to March 9, 91 days.*

Lot.	Number of animals.	Ration.	Average initial weight.	Average final weight.	Average gain (+) or loss (−).	Average daily gain (+) or loss (−).
			Pounds.	*Pounds.*	*Pounds.*	*Pounds.*
1	23	Range alone	637	531	−106	−1.16
2	15	Range plus half ration of cottonseed meal and hulls	633	676	+ 43	+0.47
4	23	Range plus half ration of coarse hay	651	579	− 72	−0.79

It may be seen that the average weight of all steers was about 640 pounds. In the work previously reported the average weight of the animals in 1908–9 was about 705 pounds, and in 1907–8 about 725 pounds. The above table shows that every steer of lot 1, which had no feed in addition to their range, lost 106 pounds in weight during the winter, while the steers fed meal and hulls in addition to the range (lot 2) gained 43 pounds per head. These steers (lot 2) received the same amount of feed per head as those in similar lots for each of the previous years, but as they were smaller animals they gained in weight instead of practically holding their own, as had been done previously. The steers of lot 4 lost 72 pounds each during the winter, showing that while the hay given them helped them to a certain extent they did not receive enough of it. It was estimated that about 11 pounds of hay was given each steer per day, but a large amount of this was refuse, which was not consumed.

The average daily gain or loss per steer was minus 1.16 pounds for lot 1, plus 0.47 pound for lot 2, and minus 0.79 pound for lot 4 during the winter of 1909–10.

AMOUNT OF FEED CONSUMED.

In Table 2 is shown the amount of concentrates and roughage fed to the steers of lot 2 during the winter. The steers of lot 1 did not receive any feed in addition to the range. The amount of hay consumed by the steers of lot 4 could not be determined accurately for reasons previously mentioned, so no weights are given.

There is no doubt that the steers of lot 1 needed a greater acreage of range than the steers which received feed in addition to the range. This is shown by the fact that they exhausted their range of 10 acres per head about four weeks before the winter was over and had to be turned out to secure something to eat from the outside. The steers of lots 2 and 4 did not eat all of the feed in their fields before the test was over, although feed became scarce and very poor in quality during the latter part of the test. If a valuation could be placed upon the range, therefore, it is seen that lot 1 should be charged more than the other lots.

The steers of lot 2 each consumed 221 pounds of cottonseed meal and 808 pounds of hulls during the winter. This was an average daily

ration of 2.4 pounds of cottonseed meal and 8.9 pounds of hulls per steer. A ration of 2.4 pounds of cottonseed meal and 8.9 pounds of hulls in addition to the range is therefore seen to produce an average daily gain of 0.47 pound on steers weighing 633 pounds each.

TABLE 2.—*Quantity of feed consumed per steer during winter 1909–10, 91 days.*

Lot.[1]	Number of steers in lot.	Ration.	Total amount consumed per steer.		Daily amount consumed per steer.	
			Cotton-seed meal.	Hulls.	Cotton-seed meal.	Hulls.
			Pounds.	*Pounds.*	*Pounds.*	*Pounds.*
2	15	Range plus cottonseed meal and hulls.....	221	808	2.4	8.9

[1] Lot 1 was on range alone; lot 4 was on range plus coarse hay, but the quantity of the latter was not accurately determined.

As there is no way of estimating the amount or price of feed per acre on range, no charge has been made for it. Range in this portion of the State is still free during the winter, and unless cattle are turned upon it the farmer gets no returns from it. When cottonseed meal is worth $26 per ton and hulls are worth $6 per ton, as they were at the time this experiment was made, the feed consumed by each steer cost 5.8 cents per day, or $5.30 per head for the whole winter.

MONTHLY GAINS OR LOSSES DURING THE WINTER.

The gains or losses made by the steers during the different months of the winter will vary greatly each year, depending chiefly upon weather conditions. Cold, dry weather does not cause severe losses in weight of beef cattle, but cold rains followed by cold winds or sleet storms injure them very materially, as they get chilled through and the feed is rendered unpalatable and at times unavailable, due to a covering of ice.

The following table shows the gains or losses made by the groups for each month during the winter of 1909–10:

TABLE 3.—*Results of feeding by 4-week periods.*

Lot.	Number of steers.	Ration.	Gain or loss per steer first period (Dec. 8 to Jan. 4).	Gain or loss per steer second period (Jan. 5 to Feb. 1).	Gain or loss per steer third period (Feb. 2 to Mar. 1).	Gain or loss per steer fourth period (Mar. 2 to Mar. 8).[1]
			Pounds.	*Pounds.*	*Pounds.*	*Pounds.*
1	23	Range alone.....	−10	−41	− 9	−46
2	15	Range plus cottonseed meal and hulls.....	+27	+ 1	+28	−13
4	23	Range plus coarse hay.....	− 8	− 5	−35	−24

[1] The last period has but 7 days.

From the table it is seen that during the month of December the steers of lot 1 each lost 10 pounds, those of lot 2 gained 27 pounds, and those of lot 4 lost 8 pounds in weight. December was the most severe month during the winter of 1909–10, and that larger losses in weight were not experienced can only be accounted for by the fact that the steers were in good flesh to withstand the weather and that the feed on the range was better during this month than at any subsequent time.

In January the losses were greater, the steers of lot 1 losing heavily, decreasing in weight 41 pounds each, while the cattle of lot 2 gained 1 pound and the steers of lot 4 lost 5 pounds each.

The losses in February were heaviest with the hay-fed cattle, as their range was becoming exhausted. The steers of lot 1 had been turned outside during this period and lost about 9 pounds each. A gain of 28 pounds per head is shown by the steers of lot 2.

The steers of all of the lots showed a heavy loss during the last week of the winter work. There is little doubt, however, that a considerable part of the loss shown during this period was made during February and was not reflected in the weights taken on March 2. This was due to the weather conditions when the cattle were weighed on March 1 and March 8, respectively. On the former day the weather was warm and the cattle had taken on a large fill; on the latter day these conditions were reversed, so that the weights taken on March 1 showed the steers in a more favorable condition than was actually the case.

FINANCIAL STATEMENTS.

The cattle had been bought during the summer and early fall of 1909, and as they were of very common breeding they had cost but 2½ cents per pound at that time. Cattle at the present time are worth from 50 to 100 per cent more in that section than they were four years ago. The following financial statement shows the cost of the cattle the following spring. No statement is given for lot 4 because the value of the hay could not be ascertained.

Financial statement of winter feeding.

Lot 1. Range alone:		
To 637-pound steer, at $2.50 per hundredweight	$15.92	
By value of same steer in spring, 531 pounds, at $3 per hundredweight		$15.93
	15.92	15.93
Lot 2. Range plus cottonseed meal and hulls:		
To 633-pound steer, at $2.50 per hundredweight	15.83	
To 223 pounds cottonseed meal, at $26 per ton	2.87	
To 808 pounds cottonseed hulls, at $6 per ton	2.42	
By value of steer in spring, 676 pounds, at $3 per hundredweight		20.28
By required increase in value over range steer to break even (12½ cents per hundredweight)		.84
	21.12	21.12

From the above statement it is seen that steers which cost 2½ cents a pound in the fall and weighed 637 pounds each at that time had cost 3 cents per pound in the spring when they received range alone and no charge was made for the range. In other words, the loss in weight during the winter had increased their cost in the spring one-half a cent per pound.

The steers of lot 2 were in fine condition in the spring, being heavier than when started in the experiment in the fall, but owing to the cost of the feed consumed their value had increased to $3.12½ per hundred pounds, or 62½ cents per hundred pounds over the fall price.

The winter work terminated March 9 and the steers were redivided into lots for the summer feeding work, and charged at their spring cost. It remains to be seen by the summer work whether it was more profitable to feed the cattle through the winter, thus bringing them through to pasture in good condition, or to permit them to run on range without feed and thereby lose about 100 pounds of flesh during the winter, bringing them to the grazing season in very poor but thrifty condition. This feature is fully discussed later.

No losses from death are recorded here among the range cattle, but it is quite common to lose a steer occasionally during severe winters, when such a loss would probably not occur if the cattle were getting some feed. That phase of the subject is not considered here and is so variable that cattlemen will have to make such deductions as will suit their conditions.

SUMMARY OF THE WINTER WORK.

1. The steers which received range alone lost 106 pounds each in weight during the winter, and this loss in weight caused an increase in cost of one-half a cent per pound in the spring. No charge was made for the grazing during the winter.

2. The steers of lot 2 made a gain of 43 pounds in weight during the 91-day period. There was an average of 2.4 pounds of cottonseed meal and 8.9 pounds of hulls consumed per day by each steer in this lot at a cost of 5.8 cents, or $5.30 for the winter.

3. The spring cost of the steers in lot 2 was $3.12½ per hundredweight, or an increase of 62½ cents per hundredweight over the fall price. They were in good condition at the close of the test.

4. The steers of lot 4, which were fed coarse damaged hay, lost 72 pounds each in weight during the winter.

SUMMARY OF THREE YEARS' WINTER WORK.

For the sake of comparison a general summary of the three years' winter work is given below. There are some variations in the figures from year to year, due chiefly to the character of the winter and the

prevailing climatic conditions. The averages of the three years' work are also included in the table:

TABLE 4.—*Summary of three years' winter feeding.*

	Lot 1. Range alone.	Lot 2. Range plus cottonseed meal and cottonseed hulls.	Lot 3. Range plus cowpea hay.	Lot 4. Range plus damaged hay.	Lot 5. Range plus cotton seed.
Average weight per steer in the fall:	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
1907–8	722	725	724	.....	.....
1908–9	705	705	.....	689	706
1909–10	637	633	.....	651	.....
Grand average	688	698	724	680	706
Gain in weight per steer during the winter:					
1907–8	− 97	− 6	−9	.....	.....
1908–9	−106	+ 3	.....	−40	−40
1909–10	−106	+43	.....	−72	.....
Grand average	−101	+ 8	−9	−64	−40
Feed consumed per steer per day:					
1907–8	None.	2.35 meal. 8.50 hulls.	8.50 cowpea hay.	.....	.....
1908–9	None.	2.41 meal. 8.71 hulls.	.....	11.8 damaged hay.	4.71 cotton seed.
1909–10	None.	2.39 meal. 8.90 hulls.	.....		
Grand average	None.	2.38 meal. 8.70 hulls.	8.50 cowpea hay.	11.8 damaged hay.	4.71 cotton seed.
Average increase in cost per hundredweight due to cost of wintering:	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*
1907–8	39	67	53	.....	.....
1908–9	45	78	.....	53	64
1909–10	50	62½	.....	.....	.....
Grand average	45	69	53	53	64
The required increase in value per hundredweight over range cattle to break even:					
1907–8	.....	28	14	.....	.....
1908–9	.....	33	.....	8	19
1909–10	.....	12½	.....	.....	.....
Grand average	.....	25	8	8	19

The weights of the steers in the various lots were very uniform each year. The steers used the last year of the test were about 85 pounds smaller than the steers used the first year.

The loss in live weight of the steers of lot 1 was very uniform for the three winters, being 97, 106, and 106 pounds, respectively, for the three years. The steers which received hulls and meal lost 6 pounds each the first year, gained 3 pounds the second year, and gained 43 pounds the final year of the experiments. The grand average for the three years shows the loss to be 101 pounds for each of the steers on range alone; a gain of 8 pounds for those fed on meal, hulls, and range; a loss of 9 pounds on those which received cowpea hay; a loss of 64 pounds on those which were fed the coarse damaged hay; and a loss of 40 pounds for those which had the range supplemented with cotton seed.

Each steer of lot 2 consumed almost the same amounts of meal and hulls per day for the three winters. The average amount consumed

for the three years was 2.38 pounds of cotton seed meal and 8.7 pounds of hulls per day. This amount, in addition to the range, proved to be enough to make 700-pound steers hold their fall weight throughout the winter.

Cowpea hay was fed but one winter, and steers which received 8½ pounds each per day weighed practically the same in the spring as in the fall. It is seen that 8½ pounds of bright cowpea hay proved equal to 8½ pounds of hulls and 2.35 pounds of cottonseed meal for wintering steers.

The cost per 100 pounds of cattle in the spring is secured by adding the cost of feeds consumed in the winter to the fall cost of the steers and dividing this total cost by the spring weight.

When no charge is made for the use of the winter range it was found that the average cost of wintering the steers, or in other words, the difference between the cost price in the fall and the cost price in the spring, for the range steers was 45 cents per hundredweight, while it was 69 cents for cattle given meal and hulls, 53 cents for those receiving cowpea hay, 53 cents for the steers fed damaged hay, and 64 cents for the steers that were given cotton seed to supplement the range.

The cost of the feeds were such that, to break even on the winter feeding, the cattle fed meal and hulls would have to be worth 25 cents per hundredweight more than the range cattle, while the cattle fed cowpea hay and those given damaged hay would have to sell for 8 cents per hundredweight more than the range stock.

II. FATTENING STEERS ON PASTURE IN ALABAMA.

Some results of fattening steers upon pasture during the summer months have already been published.[1] The results of two additional years' work are presented herewith. It should be understood, however, that this comprises only a report of the progress of the work, as the experiments are being continued and new phases of the subject are being investigated.

PLAN AND OBJECTS OF THE WORK.

The cattle were bought in the fall, as they could be bought much cheaper at that time than in the spring. In fact, steers could hardly be bought at all in the spring. When grass appears the owners of steers usually will not sell them unless at a premium. The details of carrying the cattle through the winter months are discussed in another part of this bulletin. Just as soon as the grass appeared in the spring the tests were inaugurated, and only two objects were in mind—

1. To determine the profit, if any, in fattening native Alabama steers on pasture for the fall market.

2. To determine whether it would be profitable to supplement the pasture with a small ration of cottonseed cake.

Owing to the fact that suitable pasture was not available upon the farm of the experiment station at Auburn, Ala., the work was carried on upon the land of and in cooperation with Mr. O. E. Cobb, of Sumterville, Ala., where similar work has been in progress for six years. Mr. Cobb furnished the cattle, the pastures, and the feeds, while the Bureau of Animal Industry and the experiment station authorities provided trained men to have personal supervision of the work. Messrs. H. J. Chatterton and S. S. Jerdan, both of whom are graduates of an agricultural college, were stationed upon the farm and looked after the details of the feeding.

THE CATTLE.

No attempt was made to get steers for this work which would grade far above the average of the State. Only such steers were used as could be bought in Sumter, Wilcox, Marengo, and neighboring counties. An attempt was made, however, to select the best steers from among those raised in the western part of Alabama, but as the experiments required the use of a large number of animals it was not always possible to select steers which carried a predominance of beef

[1] See Bureau of Animal Industry Bulletins 131 and 159.

blood. Nevertheless, the great majority of the animals contained some Aberdeen-Angus, Shorthorn, Hereford, Red Polled, or Devon blood. Some had a predominance of Jersey blood, and some few carried no admixture of any kind of improved blood. They varied from 2 to 4 years in age, the majority being 2 years old when they were purchased in the fall. As will be seen later, they were small. At the inauguration of the tests in April they ranged from 545 to 576 pounds in weight. They were, however, in their lightest form, as they had no doubt lost on the average not less than 75 pounds each during the previous winter months.

WINTERING THE STEERS.

Previous work has shown that it does not pay to feed such steers so as to produce marked gains in live weight, unless the object is to finish them for the market very early in the summer season. Fortunately the Cobb farm is unusually well supplied with rough and cheap feeds, and these are the kind that should be largely depended upon for getting mature steers through the winter months. Large areas of old corn and cotton fields were available. Between the rows there is always reasonably good growth of crab grass, which is really an exceedingly valuable cheap feed and affords no little grazing. Along the fences and ditches also was a considerable growth of native grasses, which had fallen down and dried after the first two or three frosts, but nevertheless afforded some grazing. During an average winter there are one or two native plants, such as wild vetch or Augusta vetch and melilotus, which come up in February and furnish some grazing until the appearance of the usual summer grasses. Of course, steers handled in this way during the cold months lose very materially in weight; in fact, during severe winters the losses by death may be quite heavy.

SUMMER PASTURE AND PASTURE LANDS.

The summer pastures used in these experiments consisted of a mixture of sweet clover (melilotus), Japan clover (lespedeza), Johnson grass, crab grass, and some Bermuda grass. The melilotus seed had been planted, but the other plants were purely voluntary. As a rule melilotus becomes available for light grazing by March 15, while the Japan clover and Bermuda grass seldom afford good grazing before May 15.

The pasture was divided into fields for the purpose of the experimental work, the size of each one depending upon the number of cattle grazed upon it, and also upon whether the steers were to be fed a light or a heavy ration, or no supplementary feed at all. The object was to have an abundance of pasture for each lot of cattle so the results obtained would be comparable.

In 1910 the pastures were ready for grazing by April 7, but the following year no material benefit could be derived from them until April 21. These two dates, therefore, mark the inauguration of the tests for the summers of 1910 and 1911.

The pasture land was rolling, some of it being rather rough and gullied, while the remainder was slightly rolling or almost level with just enough slope to drain well. The soil of the pasture lands is of three distinct classes—Houston clay, Orangeburg clay, and Waverly loam. The hill or rough portions of the pastures are made up of the Houston clay, which varies from almost white to brown in color, and is usually termed "lime-hill prairie land." The soil is 4 to 8 inches deep, underlain by 18 to 36 inches of grayish clay, which usually rests upon lime rock that outcrops frequently. The Orangeburg clay consists of 4 to 8 inches of reddish sandy loam, underlain by either red clay or sandy clay subsoil. This soil is found on the slightly rolling land between the hills and the creek. The Waverly loam is found in level stretches near the creek and branches. It is the deposition of the silt and clay from the flood waters of the streams, and is fertile, though sometimes rather wet. There is considerable lime in all of these soils, so melilotus and the other pasture plants mentioned above grow readily.

As this land is similar to that found throughout the prairie sections, or "black belt," of Alabama and Mississippi, and the pasture plants are the same throughout that region, the results secured from the grazing experiments outlined in this part of the bulletin are strictly applicable to all parts of that prairie region.

METHOD OF FEEDING AND HANDLING DURING THE SUMMER.

The steers which received no feed in addition to the pasture required very little care and attention. They were salted at regular intervals and weighed every 28 days. This was about all the attention they required.

The steers which received cottonseed cake in addition to the pasture were fed once a day, and this was done about sundown, or the cool part of the afternoon, so that all would come out to the feed troughs. The feed was not thrown upon the ground, but placed in feed troughs situated at convenient places in the pastures, and the hay when fed at all was fed from hay racks. As the steers had been dehorned the previous winter, each animal occupied not more than 3 feet at the trough. When cattle are thus fed in properly constructed hay racks and troughs practically no feed is wasted. A good supply of water was afforded by creeks and artificial pools.

During the summer of 1910 some difficulty was experienced in getting the cattle dipped properly. The dip used for destroying the cattle ticks was an emulsion of crude petroleum, but for some un-

explainable reason the oil did not emulsify and when the steers were dipped the first time several were badly blistered, and the hair and hide peeled off the legs and the lower part of the body of almost all the animals. During the remainder of the test the steers were greased by hand after being confined, one by one, in a chute. The steers made fairly satisfactory gains in spite of all of these unfavorable circumstances. In 1911 the dipping vat was filled with the official arsenical solution, and no difficulties or unfavorable results were encountered.

PRICES AND FEEDS USED.

Cottonseed cake and alfalfa hay were used in addition to the pasture. The pasture was used in all of the tests, the cottonseed cake was used for about one-half the lots, and the alfalfa hay was fed in one case only. The cottonseed cake was charged against the steers at the market price, and an estimated price, corresponding as nearly as possible to the market price, was placed upon the alfalfa hay. The following values were placed upon the feeds:

Cottonseed cake	per ton..	$26.00
Alfalfa hay	do....	16.00
Pasture (per head)	per month..	.50

The hay was practically all freshly cut alfalfa and was of excellent quality. The cottonseed cake was not of the best quality. That used in 1910, or a part of it at least, got wet while it was being hauled from the mill to the farm; and a part of this cake had been carried over and was fed in 1911. The steers ate it up clean, however. The cake had been broken into nut size and sacked at the mill.

In regard to feeding cake rather than meal, the statement in a former publication is here quoted:

> This cake can be purchased in the large cake size, just as it comes from the press, for about $2 a ton cheaper than in the nut size. Some feeders find that it pays to break the cake on their own farms. The cake is the same as cottonseed meal, except that it is not ground into meal. There are several advantages in feeding cake in place of meal, especially in summer feeding. A rain does not render the cake unpalatable, but it will often put the meal in such a condition that the cattle will not eat it. Again, no loss is incurred with the cake during windy days, whereas the meal, when fed in the open pasture, is sometimes wasted on account of the winds. Furthermore, the cake requires chewing before being swallowed, and therefore must be eaten very much slower than the meal, so when a number of steers are being fed together the greedy one has little chance to get enough cake to produce scours. When cottonseed meal is fed the greedy steer often scours because he can bolt the meal and get more than his share; this not only injures the steer but makes the bunch "feed out" unevenly.

DAILY RATIONS.

When steers are fattened on pastures in the Western States it is the custom to feed large amounts of grain, principally corn. As a result of feeding these heavy rations—sometimes as much as 20 pounds of

grain per steer daily—the western feeders cause their steers to make larger gains, as a rule, than those reported in this bulletin. It should be noted, however, that in these cases the corn is cheap compared with the price of this grain in the South.

The table below shows that the only supplementary concentrate used in these tests was cottonseed cake, and that it was used sparingly. As previously stated, the cake was only fed once a day, about sundown.

TABLE 5.—*Average daily rations.*

APRIL 7 TO AUGUST 3, 1910 (118 DAYS).

Lot.	Number of steers.	Ration.	Total feed eaten by each steer.	Average daily feed eaten by each steer.
			Pounds.	*Pounds.*
A	25	Pasture alone		
B	34	Pasture and cottonseed cake	411 cake	3.48 cake.
G	25	Pasture, cottonseed cake, and alfalfa hay	411 cake 269 hay	3.48 cake. 2.28 hay.

APRIL 21 TO SEPTEMBER 8, 1911 (141 DAYS).

A	25	Pasture alone		
B	25	Pasture and cottonseed cake	505 cake	3.58 cake.

In 1910 each steer in lots B and G were started off (April 7) on an average daily ration of 1.5 pounds of cake. On April 18 this amount was raised to 2.5 pounds, and by May 19 the amount being consumed daily was 5 pounds per steer.

Throughout the whole test each steer averaged but 3.48 pounds of cake daily. It was thought that it might be profitable to feed a small amount of alfalfa hay along with the pasture and the cake, so the steers in lot G were given an average daily feed of 2.28 pounds of hay along with the cake and the pasture. It will be seen later, however, that no favorable results were secured from the use of the hay.

It is seen that the cottonseed cake was fed sparingly in 1911 also, as each steer in lot B consumed on the average only 3.58 pounds daily. On April 21 each steer was started off on 2 pounds of cottonseed cake daily. The amount was raised gradually until May 17, when the 25 steers were being fed 94 pounds of cake each day. The amount was not increased after that date.

TOTAL AND DAILY GAINS.

When the small size of the steers is taken into consideration the gains were entirely satisfactory. The steers, however, were in exactly the proper condition for making good gains on the pastures, as the majority had simply been "roughed" through the previous winter and were, consequently, thin in flesh. Part III of this bulletin

shows that a thin steer makes much more rapid gains during the pasture season than one in good flesh. The gains also show that the pastures used were good.

TABLE 6.—*Total and daily gains.*

APRIL 7 TO AUGUST 3, 1910 (118 DAYS).

Lot.	Ration.	Average initial weight of each steer.	Average final weight of each steer.	Average total gain of each steer.	Average daily gain.
		Pounds.	*Pounds.*	*Pounds.*	*Pounds.*
A	Pasture alone	544	737	193	1.64
B	Pasture and cottonseed cake	576	809	233	1.98
C	Pasture, cottonseed cake, and alfalfa hay	563	783	220	1.86

APRIL 21 TO SEPTEMBER 8, 1911 (141 DAYS).

A	Pasture alone	563	810	247	1.75
B	Pasture and cottonseed cake	565	805	240	1.70

In 1910 the steers of lot A which ran on pasture and had no feed in addition made the smallest gains, each steer increasing 193 pounds in weight from April 7 to August 3. In lot B, where cottonseed cake supplemented the pasture, each steer made a total gain of 233 pounds. The animals in lot C, where both cake and alfalfa hay were used to supplement the pasture, made greater gains than those which were on pasture alone, but did not gain as rapidly as the steers in lot B, where cake was the only supplement. In this case it did not pay to introduce the hay into the ration, as the gains were not increased and the final selling value of the steers was not enhanced. Alfalfa hay has a laxative tendency, and when it is fed in conjunction with pasture and cake this tendency is magnified. The steers gained at the average daily rate of 1.64, 1.98, and 1.86 pounds in lots A, B, and C, respectively.

In 1911 the results do not agree with the results of 1910 in respect to the daily gains. It is noticeable, also, that the steers in lot A, where nothing was fed except pasture, made more rapid gains than those where cake was used as a supplement. The daily gains in lots A and B were 1.75 and 1.70 pounds, respectively. But, as will be seen in the financial statement, the feeding of the cake did have a favorable influence, as the cake-fed steers sold for 1 cent a pound more than the pasture-fed ones. The cake-fed steers also dressed out a slightly higher percentage of marketable meat. The cake-fed steers appeared to be in very much better condition and their hair was very much sleeker and glossier than that of the others.

QUANTITY AND COST OF FEED REQUIRED TO MAKE 100 POUNDS OF GAIN.

Table 7 shows the number of pounds of feed required to make 100 pounds of gain in each lot, the cost of the cottonseed cake to make the gains, and also the cost when both the cake and the pasture are charged against the gains. With the exception of the case where alfalfa hay was used (lot G, 1910), the increase in live weight during the fattening period was put on at a profit. That is, each pound added to the weight of the steers during the fattening period did not cost as much as it sold for on the market. This is an unusual state of affairs in fattening cattle, as under average winter conditions, and summer conditions also, where heavy supplementary grain feed is given, each pound of increase during the fattening period is made at a loss, the profit in feeding coming from the increase in value of the original weight.

The economical gains in these tests were mainly due to two factors: First, the daily gains were satisfactory, notwithstanding the fact that a small amount of high-priced feeds was consumed by each steer, and second, the animals were grazing a pasture, which is the cheapest feed that can possibly be obtained in Alabama. When a large amount of concentrated feed is used to supplement the pasture, the cost of the increase in weight will be much more expensive than was the case in these experiments.

TABLE 7.—*Quantity and cost of feed required to make 100 pounds of gain.*

APRIL 7 TO AUGUST 3, 1910 (118 DAYS).

Lot.	Ration.	Quantity of feed to make 100 pounds of gain.	Cost to make 100 pounds of gain.	
			Not including cost of pasture.	Including cost of pasture.
		Pounds.		
A	Pasture alone			$1.10
B	Pasture and cottonseed cake	176 cake	$2.29	3.19
G	Pasture, cottonseed cake, and alfalfa hay	187 cake 122 hay	3.41	4.37

APRIL 21–SEPTEMBER 8, 1911 (141 DAYS).

A	Pasture alone			$1.02
B	Pasture and cottonseed cake	229 cake	$2.98	4.03

The cheapest gains, of course, were made in the two lots where nothing was fed but pasture. But the conclusion should not be immediately drawn that the greatest profits were realized on these two lots. While exceedingly economical gains were made, the steers were cheap at the end on account of not being fat, and were sold for low prices. The financial statement sets this forth.

In 1910 it cost from $1.10 in lot A to $4.37 in lot G to make 100 pounds of increase in live weight; in lot B, where cake and pasture were fed, each 100 pounds of increase in weight cost $3.19. It is shown again, therefore, that cake with alfalfa hay was not as efficient and economical as cake alone. When cake alone was fed along with the pasture only 176 pounds were required to produce an increase in weight of 100 pounds, but when alfalfa hay and cake were both fed it required 187 pounds of cake and 122 pounds of hay to produce the same increase in weight.

During the summer of 1911, 229 pounds of cottonseed cake were required to make 100 pounds of gain. When the cost of both the pasture and the cake was charged against the gains it cost $1.02 and $4.03 to make 100 pounds of increase in weight in lots A and B, respectively.

PRICES REALIZED FOR PASTURE AND COTTONSEED CAKE WHEN FED TO THE CATTLE.

The statement below illustrates the fact that southern pastures may be put to profitable use by means of beef cattle, and adds further evidence to the assertion that the farmer can usually well afford to buy certain outside feeds—those not grown upon the farm—and feed them to his cattle. It will be observed that lot G is not included in the statement. This lot received some hay in addition to the cake, but as the hay was only a partial ration the results in this case would be inconclusive. With the price of pasture fixed at 50 cents a month per steer and cottonseed cake at $26 a ton, the following prices were realized as a result of feeding to the cattle:

Cottonseed cake, lot B:		
1910	per ton	$69.37
1911	do	50.94
Pasture:		
Lot A, 1910	for season	8.95
Lot B, 1910	do	11.02
Lot A, 1911	do	7.80
Lot B, 1911	do	8.81

It is seen that the cottonseed cake, which cost $26 a ton, was fed to the steers and sold by means of them for $50.94 and $69.37 a ton. Regarding the pasture, there are thousands of acres in the South, and good ones, too, that lie idle all the year. If these idle areas were set to pasture and grazed by live stock excellent profits could be realized. In 1910 the grazing proved to be worth from $8.95 to $11.02 for each steer. In 1911 the pasture was worth for each steer, $7.80 in lot A and $8.81 in lot B. It would not have been possible to have made these profits had the pastures not been established.

SLAUGHTER DATA.

The experimental farm was located 9 miles from the railroad, so the steers had to be driven that distance before being loaded on the cars. They were all shipped to Meridian, Miss., a distance of 40 miles, but were on the cars about 14 hours owing to a long delay through being sidetracked. The steers were weighed on the farm before being started on the road to the shipping point, as they were sold by farm weights after a 3 per cent shrink. As soon as they reached Meridian they were fed and watered, and after eating, drinking, and resting each one was weighed again.

TABLE 8.—*Slaughter data.*

1910.

Lot.	Ration.	Average farm weight of each steer after 3 per cent shrink.	Average market weight of each steer.	Average net shrinkage.	Per cent of dressed to market weight.
		Pounds.	*Pounds.*	*Pounds.*	*Per cent.*
A	Pasture alone	736	706	30	51.3
B	Pasture and cottonseed cake	809	785	24	54.2
G	Pasture, cottonseed cake, and alfalfa hay	783	714	69	57.6
	1911.				
A	Pasture alone	810	765	45	51.1
B	Pasture and cottonseed cake	805	773	32	51.4

In 1910 each steer in lots A, B, and G lost on the average 30, 24, and 69 pounds, respectively, in weight as a result of being shipped. It is seen that the hay-fed steers lost heavily in weight. On account of suffering a heavy loss in transit these steers dressed out, by market weights, a high percentage, or 57.6 per cent, while the steers in lots A and B dressed only 51.3 and 54.2 per cent, respectively. In 1911 the two lots of steers finally dressed out practically the same.

FINANCIAL STATEMENT.

The cattle from both tests were sold to a buyer of Meridian, Miss. Cattle were then, of course, much cheaper than they are now (1913), and the prices seem low compared with present prices. In 1910 the steers in lot A sold for 3½ cents a pound, those in lot B for 4½ cents a pound, and those in lot G for 4 cents a pound. In 1911 the steers in lot A sold for 3½ cents a pound and those in lot B for 4½ cents a pound. These cattle were all sold on the farm after a 3 per cent shrink. The grass-fed steers made economical gains, but they sold finally at a very low price; not so low, however, but that profits were realized.

Financial statement.

1910.		
Lot A, pasture alone:		
To 25 steers, 13,608 pounds, at $2.95 per hundredweight	$401.44	
To pasture, at 50 cents per steer per month	52.75	
Total expenditure	454.19	
By sale of 25 steers, 18,414 pounds, at $3.50 per hundredweight		$625.24
Total profit on lot	171.05	
Average profit on each steer	6.84	
Lot B, pasture and cottonseed cake:		
To 34 steers, 19,586 pounds, at $2.95 per hundredweight	577.79	
To pasture, at 50 cents per steer per month	71.74	
To 13,976 pounds of cottonseed cake, at $26 per ton	181.69	
Total expenditure	831.22	
By sale of 34 steers, 27,514 pounds, at $4.25 per hundredweight		1,134.27
Total profit on lot	302.95	
Average profit on each steer	8.91	
Lot G, pasture, cottonseed cake, and alfalfa hay:		
To 25 steers, 14,069 pounds, at $2.95 per hundredweight	415.04	
To pasture, at 50 cents per steer per month	51.75	
To 10,264 pounds of cottonseed cake, at $26 per ton	133.43	
To 6,715 pounds of alfalfa hay, at $16 per ton	53.72	
Total expenditure	653.94	
By sale of 25 steers, 19,571 pounds, at $4 per hundredweight		759.36
Total profit on lot	104.42	
Average profit on each steer	4.18	
1911.		
Lot A, pasture alone:		
To 25 steers, 14,078 pounds, at $2.50 per hundredweight	$492.73	
To pasture, at 50 cents per steer per month	63.00	
Total expenditure	555.73	
By sale of 25 steers, 20,255 pounds, at $3.50 per hundredweight		687.66
Total profit on lot	131.93	
Average profit on each steer	5.28	
Lot B, pasture and cottonseed cake:		
To 25 steers, 14,123 pounds, at $3.50 per hundredweight	494.31	
To 12,614 pounds of cottonseed cake, at $26 per ton	163.98	
To pasture, at 50 cents per steer per month	63.00	
Total expenditure	721.29	
By sale of 25 steers, 20,128 pounds, at $4.50 per hundredweight		878.59
Total profit on lot	157.30	
Average profit on each steer	6.29	

Satisfactory profits were made in every experiment and on every lot, but greater profits were made on some lots than on others. The financial results, as a whole, are in keeping with the results obtained

in former work. It paid both years to supplement the pastures with cottonseed cake, but it did not pay to feed alfalfa hay.

In 1910 each steer that was fed pasture alone (lot A) returned a clear profit of $6.84, each steer that was fed on cottonseed cake along with the pasture (lot B) returned a clear profit of $8.91, while each hay-fed animal (lot G) yielded a profit of only $4.18.

In 1911 the results were very similar to those secured in 1910. An average profit of $5.28 was made on each one of the pasture-fed steers, while $6.29 was the average profit realized on each cake-fed animal.

SUMMARY OF SUMMER WORK OF 1910 AND 1911.

1. The objects of these tests were, first, to determine the profits in fattening native Alabama steers on pasture for the fall market, and, second, to determine whether it would be profitable to supplement the pasture with a small ration of cottonseed cake.

2. The majority of the animals used carried some improved beef blood, but some had a predominance of Jersey and scrub blood. They varied from 2 to 4 years old and were small for their age.

3. The steers were divided into lots and given the following feeds: In 1910 (Apr. 7 to Aug. 3)—Lot A, pasture alone; lot B, pasture and cottonseed cake; lot G, pasture with cottonseed cake and alfalfa hay. In 1911 (Apr. 21 to Sept. 8)—Lot A, pasture alone; lot B, pasture and cottonseed cake.

4. In 1910 the average daily gains were 1.64, 1.98, and 1.86 pounds in lots A, B, and G, respectively. In 1911 the average daily gains were 1.75 and 1.70 pounds in lots A and B, respectively.

5. In 1910 the total cost to make 100 pounds of increase in live weight was $1.10, $3.19, and $4.37 in lots A, B, and G, respectively. In 1911 the total cost to make 100 pounds of gain was $1.02 and $4.03 in lots A and B, respectively.

6. In 1910 the net profits per steer were $6.84, $8.91, and $4.18 in lots A, B, and G, respectively. In 1911 the net profits per steer were $5.28 and $6.29, respectively.

7. It did not pay to use alfalfa hay along with pasture and cottonseed cake, but it did pay to feed cottonseed cake along with the pasture.

III. THE INFLUENCE OF WINTER FEEDING UPON GAINS MADE THE FOLLOWING SUMMER.

INTRODUCTION.

Mature steers in Alabama when turned upon the range to pass through the winter upon what feed they could secure from the cotton and corn fields and the native grasses on the waste lands lose very materially in live weight. In our experiments covering three winters' work the losses in weight averaged slightly over 100 pounds per head, and the steers, while still thrifty in the spring, were very poor. Other steers, which received in addition to the range a half ration of cottonseed meal and hulls, did not lose weight, but were slightly heavier in the spring than when they were started in the test the previous fall. Another lot of steers which had received a half ration of good cowpea hay in addition to the range, practically held their fall weight throughout the winter. The steers of the last two lots were in excellent condition in the spring, or in that condition which is desired by many farmers in buying steers for grazing purposes. Two other lots which were wintered, respectively, on range plus damaged hay and range plus cottonseed lost in weight during the winter, but to a much less extent than the cattle which received range alone.

The question has often arisen as to whether it is more profitable to allow steers which are to be finished for market in the summer to become as thin as is the case with those which have to depend upon the old fields to furnish winter subsistence, or to give them some feed during the winter so they would be in good condition when put on pasture in the spring. To answer this question, it is necessary to know how large gains cattle will make during the summer which had become very poor during the previous winter, as compared with the summer gains made by steers which were given some feed during the winter months. It is also desirable to know if steers thin in flesh will ever get as fat on pasture as those which are in good condition in the spring and, if so, how long it will take them to attain this degree of fatness.

It is the purpose, therefore, to here bring together information on this subject which is based on the three seasons' work reported in detail in Bureau of Animal Industry Bulletin 131 and in Parts I and II of the present bulletin. Much of the detail of the work need not now be repeated; it will suffice to mention briefly the general outline of the experiments, as follows:

GENERAL PLAN OF THE THREE YEARS' WORK.

The steers were purchased each fall, divided into lots, and wintered in five different ways, as shown in Table 9. At the end of the winter work the steers were redivided into groups, which were to be fattened on grass and supplementary feeds during the summer months. The steers that had been used in the winter work were so divided that some of the animals of each winter lot were placed in each group of cattle for the summer fattening. In this way the effects of the treatment given during the winter upon the gains made by the steers during the summer could be studied.

The feeding during the summer consisted of finishing the cattle on pasture alone, as compared with finishing them on pasture in combination with some supplementary feed, as cottonseed cake, cotton seed, cold-pressed cottonseed cake, cottonseed cake and corn, etc.

The steers used in the experiments contained a large percentage of Jersey and scrub blood, although most of them had the blood of some one of the various beef or dual-purpose breeds in their veins. All had been raised in Sumter County or neighboring counties in Alabama on tick-infested premises, and were from 2 to 4 years old. Their weights ranged from 600 to 900 pounds in the fall, with an average of about 700 pounds.

DISCUSSION OF THE RESULTS.

In order to present this subject as clearly as possible, the results will be considered from two main standpoints; the first giving a comprehensive view of the three years' work arranged under the five different methods of winter treatment, showing the results of the summer feeding obtained from each one separately (see Table 9); the second presenting a similar view under each of the six methods of summer fattening, showing in a direct manner the results of the several methods of winter treatment upon the gains made with each kind of summer feed (see Table 10). These tables are also supplemented by three charts (figs. 2, 3, and 4), giving the results in graphic form.

COMPARISON OF RESULTS UNDER WINTER METHODS OF FEEDING.

The results secured under each method of winter feeding are seen in Table 9, which is divided into five sections, each one representing a fixed winter ration followed by various kinds of summer feeding, both winter and summer work extending over three years. The winter lots of cattle are designated by the numbers 1, 2, 3, 4, and 5, while those fed during the summers are listed as groups A, B, C, E, F, and G, each number and each letter standing for a separate method of feeding. The columns of the table show, in order, the number of steers in each summer group, the average weights in the fall, and the average total and daily gains for the winter and summer, and for both combined.

TABLE 9.—*Results of winter feeding of steers on subsequent gains in summer fattening.*

1. STEERS WINTERED ON RANGE ALONE.

Group and summer ration (average for 3 years 1908, 1909, and 1910).	Number of steers in group.	Average weight of steers in fall.	Winter gains.[1]		Summer gains.		Combined winter and summer gains.	
			Average total gain per steer.	Average daily gain per steer.	Average total gain per steer.	Average daily gain per steer.	Average total gain per steer.	Average daily gain per steer.
		Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
Group A. Pasture alone	17	662	— 92	—1.02	225	1.79	133	0.62
Group B. Pasture and cottonseed cake (medium ration)	25	692	—104	—1.14	282	2.21	178	.82
Group C. Pasture and cold-pressed cake	8	723	— 99	—1.18	196	1.74	97	.49
Group E. Pasture and cotton seed	6	709	—117	—1.19	351	2.28	234	.93
Group F. Pasture and cottonseed cake (heavy ration)	12	715	—102	—1.08	267	2.31	165	.79
Group G. Pasture, cottonseed cake, and alfalfa hay	4	592	— 93	— .94	267	2.26	174	.81
Average for all groups		688	—101	—1.10	261	2.09	160	.74

2. STEERS WINTERED ON RANGE AND COTTONSEED MEAL AND HULLS.

Group A. Pasture alone	18	723	— 14	—0.16	194	1.53	180	0.83
Group B. Pasture and cottonseed cake (medium ration)	21	681	— 8	— .09	244	1.89	236	1.07
Group C. Pasture and cold-pressed cake	10	689	— 1	— .01	215	1.92	214	1.09
Group E. Pasture and cotton seed	3	675	30	.23	263	1.71	293	1.17
Group F. Pasture and cottonseed cake (heavy ration)	13	729	60	.63	208	1.71	268	1.24
Group G. Pasture, cottonseed cake, and alfalfa hay	3	571	39	.43	224	1.90	263	1.26
Average for all groups		698	8	.088	220	1.76	228	1.06

3. STEERS WINTERED ON RANGE AND COWPEA HAY.

Group A. Pasture alone	9	767	— 21	—0.25	170	1.52	149	0.76
Group B. Pasture and cottonseed cake	8	678	— 10	— .12	248	2.22	238	1.22
Group C. Pasture and cold-pressed cake	7	722	6	.07	212	1.89	218	1.11
Average for all groups		724	—9.6	— .11	208	1.86	199	1.01

4. STEERS WINTERED ON RANGE AND DAMAGED HAY.[2]

Group A. Pasture alone	11	648	— 66	—0.70	218	1.59	152	0.65
Group B. Pasture and cottonseed cake	12	643	— 51	— .54	244	1.76	193	.82
Group E. Pasture and cotton seed	3	731	— 52	— .53	341	2.22	289	1.15
Group F. Pasture and cottonseed cake (heavy ration)	17	729	— 63	— .67	228	2.00	165	.79
Average for all groups		680	— 64	— .67	236	1.83	172	.77

5. STEERS WINTERED ON RANGE AND COTTON SEED.

Group A. Pasture alone	5	657	— 44	—0.45	284	1.84	240	0.95
Group B. Pasture and cottonseed cake	9	671	— 47	— .48	301	1.95	253	1.01
Group E. Pasture and cotton seed	3	717	— 46	— .47	270	1.76	224	.89
Group F. Pasture and cottonseed cake (heavy ration)	8	772	— 25	— .26	280	2.00	255	1.07
Average for all groups		706	— 40	— .40	287	1.93	248	1.00

[1] A minus sign (—) indicates loss.

[2] The figures used for group 4 are for the whole period of 98 days of the year 1909 instead of the 70-day period reported in Bureau of Animal Industry Bulletin 131.

STEERS WINTERED ON RANGE ALONE.

In the first section of the table are shown the results secured on the steers of lot 1, which were later divided among the groups A, B, C, E, F, and G for the summer work. There were in lot 1 a total of 72 steers which received no feed during the winter except what they secured from the open range. It is seen that the various groups in this lot did not lose the same in weight during the winter, as these losses ranged from 92 pounds on the steers that were later fed as group A to 117 pounds for the six steers that were fed during the summer in group E. The losses do not seem so variable, however, when they are compared with the average loss, which was 101 pounds for all the steers of the lot. The six steers of group E, which lost 117 pounds each during the winter, experienced this loss in a 98-day period.

The 72 steers of lot 1 averaged 688 pounds each in weight in the fall and lost an average of 101 pounds each during the winter, or 1.10 pounds per day per steer during that period.

As the length of the winter feeding periods varied from 84 to 98 days and the same number of steers were not used in each lot for each of the three winters, it can readily be understood that the efficiency of the feeds should not be judged by a comparison of the total gain or loss in weight per steer, but should rest upon a comparison of the average daily losses per head. The average daily losses for all steers of lot 1 was 1.10 pounds per steer, and there is no great variation from this average except in the case of group G, in which there were but four steers.

During the summer there is seen to be great variations in the total gains and the daily gains per steer, as each group was given a different feed, although they were all wintered alike.

The steers of group A, which were grazed on pasture without feed during the summer, made an average daily gain of 1.79 pounds per day during the summer, or an average of 0.62 of a pound per day for the winter and summer periods combined.

The steers of group B, however, which had been wintered exactly the same as those of group A but received cake in addition to pasture in the summer, made a daily gain of 2.21 pounds per steer during the summer, or 0.82 of a pound per day for the winter and summer periods.

In group C, which was fed pasture with cold-pressed cottonseed cake in addition, the daily gain during the summer was 1.74 pounds each, or 0.49 of a pound per day for the two periods.

The steers fed cotton seed in addition to pasture (lot E) did better, gaining 2.28 pounds per steer per day in the summer and 0.93 of a pound for both winter and summer, while each steer of group G, which received cottonseed cake and alfalfa hay with the pasture, made 2.26 pounds gain per day during the summer and 0.81 of a pound for the combined periods.

Group F was composed each year of some steers from each of the winter lots that were heavier and in better flesh in the spring than the

average of the lot. They were finished for early summer market by feeding a heavier ration of cottonseed cake on grass for a short time, hence this group is not directly comparable with any of the other summer groups of cattle. However, the steers of group F in lot 1 can be compared with group F in lot 2, etc.

Each steer in group F, lot 1, made a daily gain of 2.31 pounds per steer during the summer. As they had made a daily loss of 1.08 pounds each during the winter the average daily gain for the whole period was reduced to 0.79 of a pound per steer per day.

The average daily gain during the summer for all steers in the various groups of lot 1 was 2.09 pounds per head, and the average daily gain per steer for the winter and summer periods combined was 0.74 of a pound.

The average for all the groups of lot 1 shows the loss to be 101 pounds per steer during the winter and the summer gain to be 261 pounds per steer, or a net gain of 160 pounds per steer for a period of about seven months. While these steers made a daily gain of 2.09 pounds each during every day of the summer period, they had a winter loss of 101 pounds to overcome, so the total gain for the whole period was low.

STEERS WINTERED ON RANGE AND COTTONSEED MEAL AND HULLS.

Under lot 2 are shown the results secured by feeding steers a half ration of cottonseed meal and hulls during the winter in addition to the grasses of the open range. It is immediately seen that the steers in this lot did not experience the loss in weight as was the case with the steers of lot 1. The total gain per steer during the winter for all of the groups in lot 2 except group F varied from a loss of 14 pounds per head to a gain in weight of 39 pounds per head, and the average daily gains varied from a loss of 0.16 of a pound per steer to a gain of 0.43 of a pound per steer. The steers in group F are left out of the comparison for the reason previously stated. The average gain for each steer of lot 2 for the whole winter was 8 pounds, while the steers of lot 1 experienced an average loss of 101 pounds per head.

During the summer the steers of lot 2, which received pasture alone, made the smallest daily gains. They also made the smallest daily gains for the whole test, or from fall until the end of the test in the summer. The largest daily gains during the summer were made by the steers which received cold-pressed cottonseed cake on pasture. This gain amounted to 1.92 pounds per day.

The steers fed cottonseed cake in addition to pasture and those fed cottonseed cake and alfalfa hay on pasture gave practically the same results, gaining an average of 1.89 and 1.90 pounds per day per head. Cottonseed failed to produce as good gains on these steers as cottonseed cake during the summer months, but the gain produced during the winter and summer periods when combined was practically the same for each lot.

The average of all steers in lot 2 shows that by giving a half ration of cottonseed meal and hulls to the steers on winter range there was no loss in weight, but a gain of 8 pounds each. The gain made during the summer, 220 pounds, was not as large as that made by the thin steers, but the total gain in weight for the whole period was 228 pounds, as compared with 160 pounds for lot 1. Lots 1 and 2 are strictly comparable, as the total number of steers was 72 and 68, respectively, and each lot was composed of similar groups of cattle which were fed during the same period of time.

STEERS WINTERED ON RANGE AND COWPEA HAY.

The cattle of lot 3 were fed cowpea hay while running upon the range during the winter. They averaged 724 pounds in weight and lost 9.6 pounds each during the winter, or a daily loss of 0.11 of a pound per steer. When put on pasture the following summer, they made excellent gains. The daily gains made per steer were 1.52 pounds for the steers fed on pasture alone; 2.22 pounds for those fed on pasture plus cottonseed cake; and 1.89 pounds for those fed on pasture plus cold-pressed cottonseed cake.

The average for all steers of lot 3 shows that while they lost but 0.11 of a pound per steer per day during the winter, the summer gain was 1.86 pounds per steer daily, making an average of 1.01 pounds per day for the winter and summer. These steers made better daily gains during the summer than those in lot 2, but when the summer and winter periods are combined, they did not make quite as large daily gains.

The steers of lot 3 made slight losses in weight during the winter, but somewhat larger gains during the summer than did the steers of lot 2. Good bright cowpea hay proved equally as valuable as the cottonseed meal and hulls for wintering cattle, and when meal was worth $26 per ton and hulls $6 per ton, cowpea hay proved to be worth $13 per ton on the farm.

STEERS WINTERED ON RANGE AND DAMAGED HAY.

The cattle of lot 4, which were wintered on range and coarse damaged hay, weighed 680 pounds each in the fall and 616 pounds each in the spring. The daily loss in weight per steer was 0.67 of a pound. During the summer months they made daily gains varying from 1.59 to 2.22 pounds per head, depending upon which supplementary feed they received. The average daily gain for both summer and winter periods amounted to 0.77 of a pound per day for each of the 43 steers in the lot.

The steers of lot 4 lost 64 pounds each in weight during the winter, but when grazed during the summer they made an average daily gain of 1.83 pounds per steer, or slightly larger summer gains than steers wintered on meal and hulls. Their average daily gain for the whole period, however, dropped to 0.77 of a pound each per day, or slightly

more than made by steers which received no feed but range during the winter. These steers did not make as large gains on pasture as the steers of lot 1.

STEERS WINTERED ON RANGE AND COTTON SEED.

The winter ration fed to lot 5 was cotton seed, in addition to the winter range. These steers were not fed enough cotton seed to maintain their weight throughout the winter. They averaged 706 pounds in weight when the test started, and lost 40 pounds per head during the winter. However, when turned upon pasture and given supplementary feed, they made exceedingly good gains.

The steers which received pasture alone in summer made 1.84 pounds per day, while the fed steers gained at a rate of 1.76 to 2 pounds per day. The average summer daily gain of each of the 25 steers in the lot was 1.93 pounds, the total gain per steer being 287 pounds. For the combined winter and summer periods each of the steers of lot 5 made an average gain of 1 pound per day.

It is seen that a small amount of cotton seed, about 4.70 pounds, given to every steer on range each day of the winter prevented them from losing 61 pounds in weight. With this small amount of feed the steers of lot 5 lost but 40 pounds each during the winter season. At the time the cotton seed was fed it was worth but $14 per ton and was cheaper to use in that quantity than meal and hulls. The gain made the following summer by these steers was good, being 1.93 pounds per steer per day, which was the highest daily gain made during the summer by any of the lots of steers which had received feed during the winter. The average gain made for the winter and summer was 1 pound per steer per day, or practically the same as made by the steers fed on cowpea hay, but less than that made by cattle wintered on meal and hulls.

The costs of wintering these steers has been discussed in a previous publication, but with the price existing at the time when the work was done, the cowpea hay and the cotton seed proved more profitable than the meal and hulls for wintering cattle.

COMPARISON OF RESULTS UNDER SUMMER METHODS OF FEEDING.

The comparisons which have heretofore been made have been with the various lots of steers which were handled the same way during the winter but finished by different methods on pasture. There is another and more important comparison which should be made, however, in order to properly show the effects of different methods of wintering cattle upon the size of the summer gains. This comparison reverses the former method—that is, the groups are compared which were wintered on different feeds but all of which received similar treatment during the pasture season. For instance, compare the results secured with group A under each of the five separate winter lots of cattle. Each of these groups was fed on a different feed during the winter, but the steers of group A in every case were

finished in one pasture on grass alone the following summer. The grass received and the method of handling were therefore just the same for each steer during this period. This method of comparing the results is seen in Table 10, which follows:

TABLE 10.—*Comparison of summer gains resulting from various methods of winter feeding.*

A. STEERS SUMMERED ON PASTURE ALONE.

Lot and winter ration (average for 3 years, 1908, 1909, and 1910).	Number of steers in summer group.	Average weight in fall.	Winter gains.[1]		Summer gains.		Combined winter and summer gains.	
			Average total gain per steer.	Average daily gain per steer.	Average total gain per steer.	Average daily gain per steer.	Average total gain per steer.	Average daily gain per steer.
		Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Lot 1. Range alone	17	662	— 92	—1.02	225	1.79	133	0.62
Lot 2. Range and cottonseed meal and hulls	18	723	— 14	— .16	194	1.53	180	.83
Lot 3. Range and cowpea hay	9	767	— 21	— .25	170	1.52	149	.76
Lot 4. Range and damaged hay	11	648	— 66	— .70	218	1.59	152	.65
Lot 5. Range and cotton seed	5	657	— 44	— .45	284	1.84	240	.95
Grand average		693	— 49	— .54	211	1.64	162	.74

B. STEERS SUMMERED ON PASTURE AND COTTONSEED CAKE (MEDIUM RATION).

Lot 1. Range alone	25	692	—104	—1.14	282	2.21	178	0.82
Lot 2. Range and cottonseed meal and hulls	21	681	— 8	— .09	244	1.89	236	1.07
Lot 3. Range and cowpea hay	8	678	— 10	— .12	248	2.22	238	1.22
Lot 4. Range and damaged hay	12	643	— 51	— .54	244	1.76	193	.82
Lot 5. Range and cotton seed	9	671	— 47	— .48	301	1.95	253	1.01
Grand average		677	— 52	— .56	264	2.02	212	.96

C. STEERS SUMMERED ON PASTURE AND COLD-PRESSED CAKE.

Lot 1. Range alone	8	723	— 99	—1.18	196	1.74	97	0.49
Lot 2. Range and cottonseed meal and hulls	10	689	— 1	— .01	215	1.92	214	1.09
Lot 3. Range and cowpea hay	7	722	6	.07	212	1.89	218	1.11
Grand average		709	— 30	— .36	208	1.85	178	.90

E. STEERS SUMMERED ON PASTURE AND COTTON SEED.

Lot 1. Range alone	6	709	—117	—1.19	351	2.28	234	0.93
Lot 2. Range and cottonseed meal and hulls	3	675	30	.23	263	1.71	293	1.17
Lot 4. Range and damaged hay	3	731	— 52	— .53	341	2.22	289	1.15
Lot 5. Range and cotton seed	3	717	— 46	— .47	270	1.76	224	.89
Grand average		708	— 60	— .63	315	2.05	255	1.01

F. STEERS SUMMERED ON PASTURE AND COTTONSEED CAKE (HEAVY RATION)—SPECIAL GROUP.

Lot 1. Range alone	12	715	—102	—1.08	267	2.31	165	0.79
Lot 2. Range and cottonseed meal and hulls	13	729	60	.63	208	1.71	268	1.24
Lot 4. Range and damaged hay	17	729	— 63	— .67	228	2.00	165	.79
Lot 5. Range and cotton seed	8	772	— 25	— .26	280	2.00	255	1.07
Grand average		733	— 34	— .36	240	1.87	206	.95

E. STEERS SUMMERED ON PASTURE, COTTONSEED CAKE, AND ALFALFA HAY.

Lot 1. Range alone	4	592	— 93	—0.94	267	2.26	174	0.81
Lot 2. Range and cottonseed meal and hulls	3	571	39	.43	224	1.90	263	1.26
Grand average		583	— 36	— .35	249	2.11	212	1.00

[1] A minus sign (—) indicates loss.

STEERS SUMMERED ON PASTURE ALONE.

The steers of group A, lot 1, received range alone in winter and grass alone in the summer and made an average daily loss of 1.02 pounds in winter and a gain of 1.79 pounds in the summer, or a total average daily gain for winter and summer of 0.62 of a pound per steer. The cattle of group A, lot 2, were fed range plus meal and hulls in the winter, and pasture alone in the summer, and made an average daily loss of 0.16 of a pound per steer in the winter and 1.53 pounds gain during the summer, or an average daily gain for summer and winter of 0.83 of a pound per head.

For the cattle in lot 3, the average loss per day in the winter was 0.25 of a pound; a gain of 1.52 pounds was made in the summer, and a gain of 0.76 of a pound for summer and winter. Those of lot 4 lost 0.70 of a pound per day in winter and gained 1.59 pounds in the summer, or gained 0.65 of a pound daily for the whole period. The average daily loss in the winter for each steer of lot 5 was 0.45 of a pound; they gained 1.84 pounds in the summer and 0.95 of a pound for the winter and summer periods taken together.

These figures show very clearly that the steers which were not fed during the winter made larger losses during that time, but they made larger gains during the summer. Further, the larger the losses which were made during the winter, the greater were the gains made during the grazing season to a certain limit. The increased gains made during the summer were not great enough, however, to completely overbalance the excess losses during the winter, so it is seen that the smaller the daily loss per steer, during the winter, the greater is the average daily gain when both the winter and the summer periods are considered as one.

STEERS SUMMERED ON PASTURE AND A MEDIUM RATION OF COTTONSEED CAKE.

The steers which made up group B in each of the lots responded to their winter treatment during the following summer in practically the same way as did the steers of group A. The steers of lot 1, group B, made a heavy loss during the winter, but made very large daily gains during the pasture season.

When lot 2, group B, is compared with lot 3, group B, it is seen that the steers of the latter lot lost but 2 pounds more per steer during the winter than the steers of lot 2, which received cottonseed meal and hulls as the supplementary feed while on range. During the summer the daily gains made by the steers of lots 2 and 3 were 1.89 and 2.22 pounds per steer per day, respectively. This indicates that bright cowpea hay is a better supplementary feed for winter range than hulls and meal with respect to its effect upon the summer gains, but the relative price of cowpea hay and meal and hulls will determine which is the most economical winter feed.

STEERS SUMMERED ON PASTURE AND COLD PRESSED CAKE.

Group C was composed of steers which received cold-pressed cottonseed cake as a summer feed. This was not fed each summer of the 3 years as were some of the other lots, but was fed during 1908 only. This group gave different results from the others mentioned with respect to the steers which made the greatest gains during the summer. For some reason which can not be explained the steers of group C which lost the most in weight during winter made the smallest gains when put on pasture. The steers which were fed during the winter and were as heavy in the spring as in the fall (those of lots 2 and 3) gained more by one-sixth of a pound per steer per day during the grazing season than the steers of lot 1, in this group, which were wintered on range alone.

STEERS SUMMERED ON PASTURE AND COTTON SEED.

The steers of group E were fed during 1909 only. The price of cotton seed since that time has been so high that it has been better policy to trade it for cottonseed meal or cake than to feed the raw seed. During this year, however, the steers which made up group E had been wintered in lots 1, 2, 4, and 5. Those which had been wintered in lot 1 experienced the heaviest winter loss by far, and made the largest daily gains on pasture, but these heavy gains on pasture (2.28 pounds per steer per day) were not great enough to overcome the difference in the winter losses when compared with those of the other lots. In other words, the steers which became so poor during the winter gained much faster during the summer months than the heavier fleshed steers, but at the end of the feeding experiment they were still lighter in weight than the steers which received feed during the winter.

STEERS SUMMERED ON PASTURE AND A HEAVY RATION OF COTTONSEED CAKE.

As has been previously explained, the steers of group F were larger and fleshier than the steers of the other groups. They were selected thus so they could be finished in a shorter time for the market, and were fed a heavier ration of cottonseed cake per day during the summer feeding period. They are, therefore, not strictly comparable with the other groups. The steers in this group which lost the greatest amount of flesh during the winter gained fastest in weight during the summer, but never got as heavy as the steers which lost no flesh during the winter. The steers which had passed the winter on range alone were not nearly as well finished at the time they were sold as were the other steers which had received winter feed. This was more noticeable with this group of steers than with any of the groups which were fed for a longer summer period.

The daily gains per steer for the winter and summer combined were but 0.79 of a pound per day for the steers in this group which subsisted on range alone during the winter, while the average daily gains for those which were fed during the winter were 1.24, 0.79, and 1.07 pounds, respectively. There is no doubt that steers which are to be finished for the early summer market can be profitably wintered by the use of supplementary feeds in conjunction with range. For such steers the use of winter feeds is more economical than permitting them to become thin in flesh by depending upon the open range for their winter feed. The object is to get the steers fat early in the season while prices are still high for fat cattle, and thin steers will not become fat enough for slaughter purposes until late in the summer. At that time prices are usually much lower because of the competition of straight grass cattle.

STEERS SUMMERED ON PASTURE, COTTONSEED CAKE, AND ALFALFA HAY.

The steers of group G which were wintered on range alone lost 93 pounds per head, while those which were given meal and hulls during the winter gained 39 pounds each. During the summer the thin steers gained 267 pounds in weight while those which had increased in weight during the winter gained 224 pounds during the pasture season. When the total gains for the whole period of 7 months are considered, the steers of lot 1 made a total gain of 174 pounds each while those of lot 2 gained 263 pounds each, or the average daily gains per steer for these periods were 0.81 and 1.26 pounds, respectively.

A GRAPHIC PRESENTATION OF THE RESULTS OF THE FEEDING.

The charts, figures 2, 3, and 4, present the results of the work in a different way and bring out some important points in the feeding more forcibly than can be done in tabular form. Each chart represents a year's work, portraying the results secured in the years 1907–8, 1908–9, and 1909–10, respectively.

The heavy dotted horizontal line O represents the dividing line between a gain in weight and a loss in weight. The heavy dotted vertical line represents the dividing line between the winter and the summer work. Each check horizontally represents a period of 20 days. Each check vertically represents a loss of 0.4 of a pound per day in weight for each steer if below the heavy horizontal line, or a gain in weight of 0.4 of a pound per steer per day if above the line.

Each lot of steers fed during the winter is represented by a line to the left of the heavy vertical line. Each diagonal line to the right of the vertical line represents one of the groups of steers which were fed during the summer. In figure 2, therefore, the line O–1 shows the loss in weight made by each steer in lot 1 during the winter of 1907–8. At the end of the winter test the steers of lot 1 were divided among the groups A, B, and C to be finished on grass during the summer.

The gains made by each of these groups of steers are shown by the lines A–1, B–1, C–1, respectively. The distance a line terminates above or below the horizontal line O determines the relative size of the daily gain or loss per steer, as the case may be, with respect to

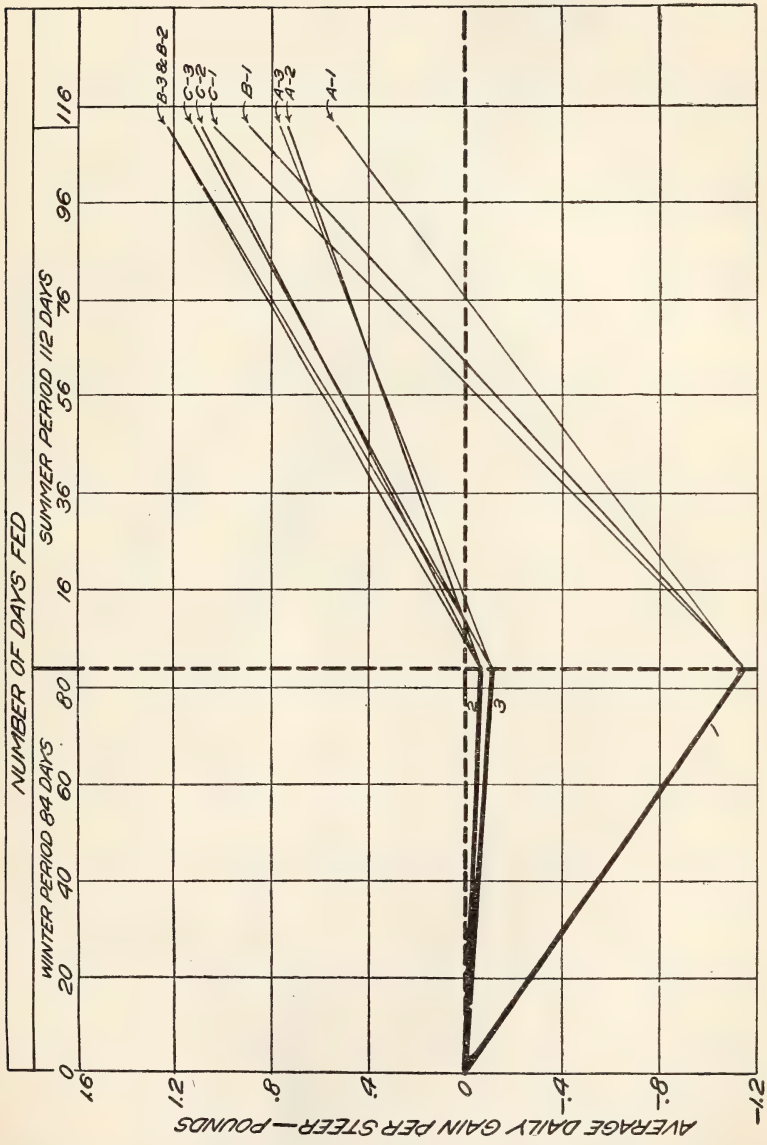

FIG. 2.—Effects of three methods of wintering steers upon the gains made during the winter and the following summer. Work of 1907–1908.

the other lots. The distance the line terminates to the right of the vertical represents the length of the feeding period. The general direction each of these lines takes, therefore, indicates the rapidity of the gains made by the steers of the respective groups.

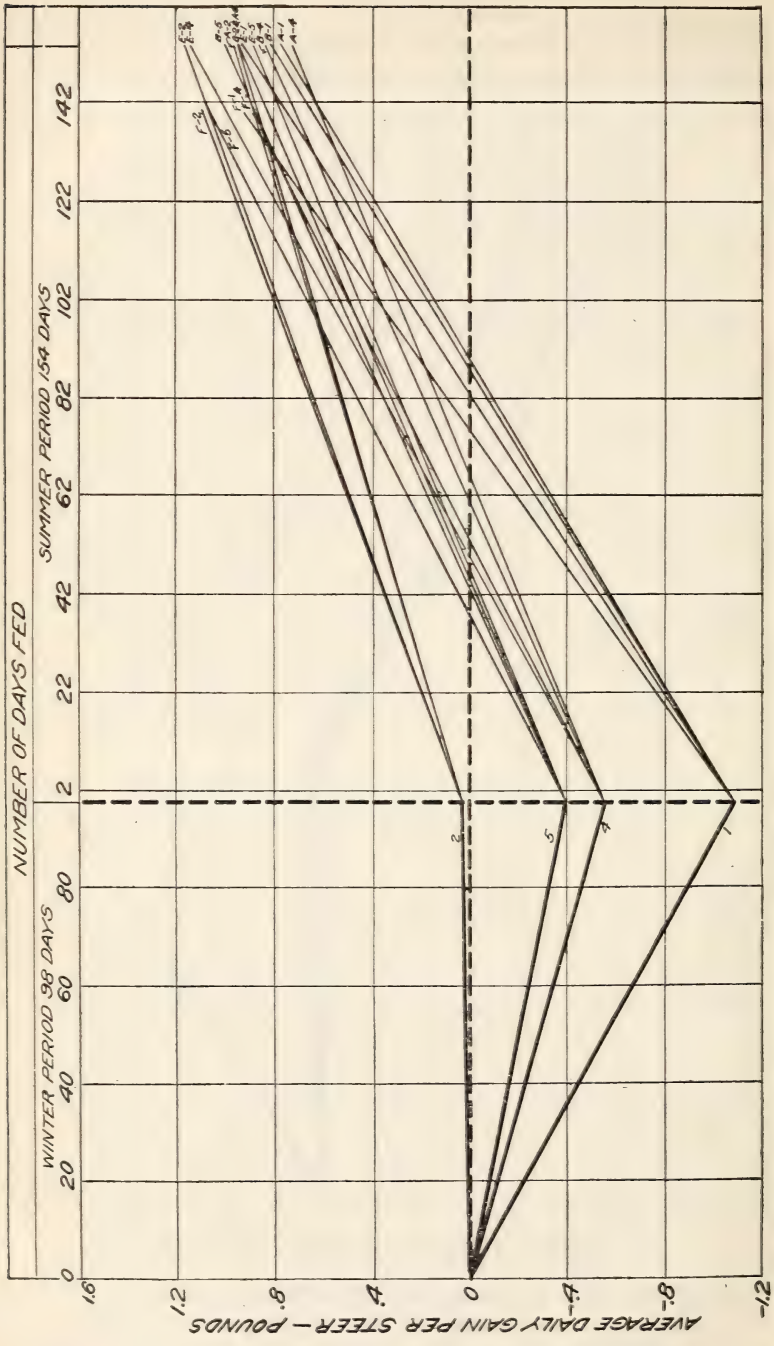

FIG. 3.—Effects of four methods of wintering steers in 1908-1909 upon the gains made during the winter and the following summer.

In figure 2, all of the steers are seen to have been fed the same length of time during the summer. A glance at the 3 charts will show that while some of the winter lots experienced heavy losses in weight, these cattle gained more rapidly during the summer months and

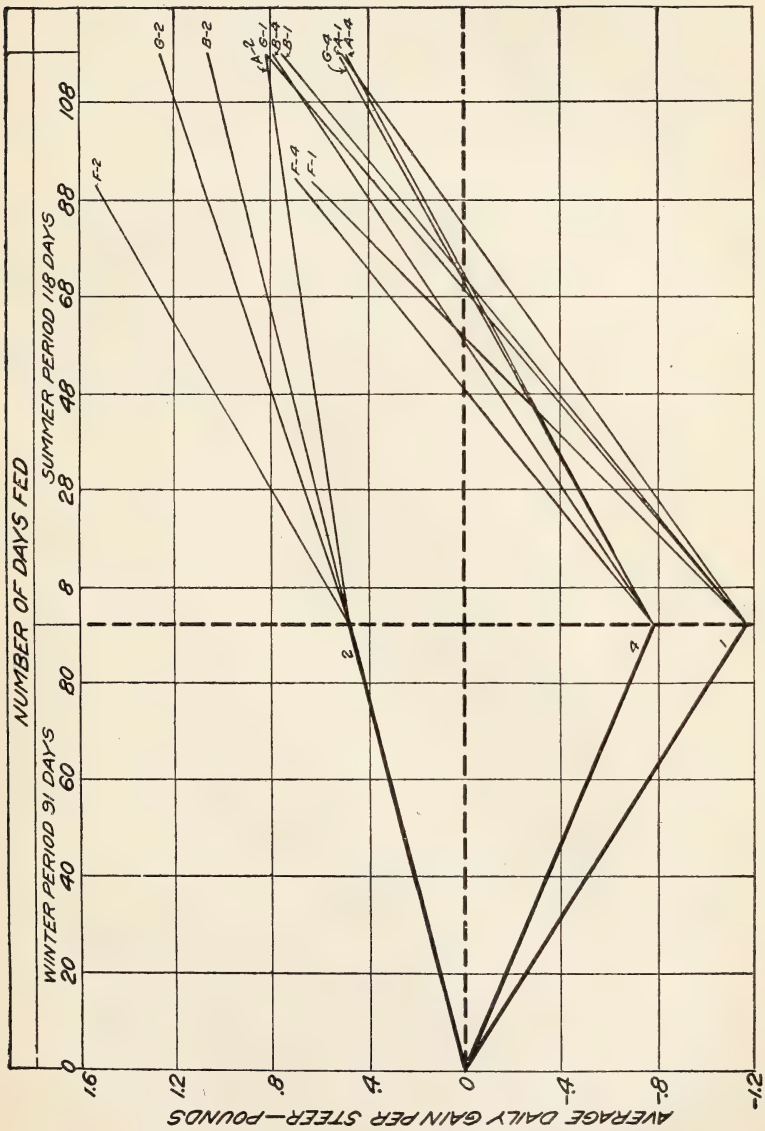

FIG. 4.—Effects of three methods of wintering steers during 1909–1910 upon the gains made during the winter and the following summer.

approached the mean or the average of all lots more rapidly than the steers which lost a smaller amount of flesh during the winter.

The length of the summer-feeding periods for the years 1908, 1909, and 1910 were 112, 154, and 118 days, respectively, for all cattle

except those of group F. Figures 2 and 3 clearly show that the longer the summer-feeding period the nearer the total gains in weight approach the mean of all lots; in other words, the longer the summer period the nearer the steers, which made heavy winter losses, overcame these losses and approached the weight of the winter-fed steers. If the feeding periods had been 60 days longer and all steers had continued to increase in weight at the rate they had established during the actual summer-feeding period the total gains at this time would have been practically the same for all lots irrespective of the method of wintering.

The semistarvation of the steers on range alone during the winter in connection with their rapid increase in weight when put on grass the following summer, corresponds to the loss in weight of a human being during a spell of sickness or starvation, and the rapid gains in weight made during and immediately after convalescence on an amount of food which during a normal period would cause him only to maintain his weight, or at most gain very slightly. Like the human being also, after the steer reaches his normal degree of fatness the smaller are the daily gains in weight.

The charts also show that the gains for summer and winter periods combined are more rapid with group F than with any other group of steers for the same, length of time. In other words, the wintering of cattle by the use of feed in addition to the natural range will be both economical and profitable for cattle which are to be fattened early in the summer, but the longer the grazing season the less economical and profitable the winter feeding will be. If the steers in these tests had been grazed until pasture gave out in October, instead of being sold in July and August, it is extremely doubtful if any difference could have been detected between the steers which wintered on range alone and those which received feeds. Consequently, if this had happened, the feeds given during the winter would have been wasted.

Figure 4, presenting the work of 1910, shows that lot 2 made such a large gain in weight during the winter, viz, 43 pounds per head, that by the end of the summer these steers had made much larger total gains than the steers of the other lots. The chart also indicates that if the rate of gains for all the groups had continued in the same direction they showed at the close of the test, all but group F would have reached practically the same point within 60 days—that is, the lines in the chart would have merged. The results are, therefore, in entire keeping with those of the two previous years. Group F can not be compared with the other groups, as these steers were in a different class, being older, heavier, and fleshier at the beginning of the test, and especially selected for quick finishing. All the steers in the other groups were similar.

The results for the three years have been such that the statement seems justified that it will not pay to feed mature steers of medium or inferior quality during the winter if they are to be kept until the end of the following summer, provided the waste lands, old fields, and the stalk fields of the farm will yield enough feed to keep them strong and thrifty until spring comes. This is true even though the steers may become very thin in flesh during the winter. If the fields become depleted, however, before the winter is over, feeding should be resorted to in order that the cattle shall not be lost by starvation.

PROFITABLENESS OF WINTERING CATTLE BY FEEDING.

The question may still be asked, "Was it profitable to feed any of the steers except those of group F during the winter months?" In answer to this the following statements may be made: When no value was placed on the range, as in this case, it cost nothing but the loss in weight to winter the steers. Since the value of each steer will be reckoned by his final summer weight, no charge should be made here for the winter loss in weight. The cost of wintering the other steers ranged from $3.23 per head for the steers wintered on cotton seed and range to $5.63 each for the cattle fed on meal and hulls during 1909. The average cost of the feeding for all winters of lots 2, 3, and 5 was $4.25.

Now, for the entire time the cattle were on feed each fed steer gained about 0.27 of a pound per day more than the range steers, or a total of about 60 pounds more per steer during the combined winter and summer seasons. The winter-fed steers were therefore 60 pounds heavier than the range-fed steers at the end of the summer. As the weight of the range-fed steers was about 850 pounds, the average weight of the others was about 910 pounds. Some southern markets will pay slightly more per pound for the heavier steers than they will for lighter steers of the same quality, while others make little difference in price where the variation is but 60 pounds per steer. There has been secured, then, in return for the cost of wintering 60 pounds of flesh on each steer in addition to the increased selling price per hundredweight in favor of the heavier steers. The cost of wintering in this case was $4.25.

The prices of feeds used in this estimate were $26 per ton for cottonseed meal, $6 per ton for hulls, $10 per ton for cowpea hay, and $14 per ton for cotton seed. Anyone can determine approximately from these statements whether or not it will pay him to winter his stock, providing that he knows about what his steers are worth per pound and what difference his market will make in favor of the heavier steers when sold. The cost given above for wintering steers should be increased about 25 per cent to be in keeping with the present (1913) prices of feeds.

The steers in the experiments sold for about 4½ cents a pound on the farm, so we have the following statement:

To cost of wintering 1 steer	$4.25	
By value of 60 pounds increase in weight, at 4½ cents a pound		$2.70
By increased value of 17 cents per hundredweight on the heavier steers over the lighter ones necessary to break even		1.55
Total	4.25	4.25

From the above it is seen that the winter-fed steers would have to sell for 17 cents per hundred pounds more than the others to pay for the winter feed. A reliable commission man of New Orleans stated that the heavier steers would sell for about 25 cents per hundredweight more on that market, while buyers from Atlanta, Ga., and Meridian, Miss., who purchased some of the steers, stated that for their trade there was not enough difference in weight to cause a variation in price.

SUMMARY.

1. Cattle which became very thin during the winter made larger daily gains the following summer on pasture than steers which were in better flesh at the beginning of the pasture season.

2. Usually the greater the winter loss experienced, the greater was the gain the following summer, and vice versa.

3. Steers which are to be finished for the early summer markets should enter the pastures in good flesh in the spring. Such cattle sell for a premium which justifies the expense of giving them feed in addition to the range during the winter months and a heavy ration of cottonseed cake while on pasture during the summer.

4. Although steers which were wintered on range alone made larger gains during the summer, the total gains made from fall until the steers were sold were usually smaller than those made by steers which were given feed in addition to winter range and subsequently finished on pasture.

5. The difference in live weight amounted to 109 pounds per steer at the beginning of the pasture season and 60 pounds per steer at the time the steers were sold. This difference in weight was in favor of the winter-fed steers.

6. Steers which had been wintered on a half ration of cowpea hay and range made practically the same gains during the combined winter and summer periods as steers that were wintered on a half ration of meal and hulls plus range.

7. When cotton seed is worth but $14 per ton it can be used with greater economy than cotton seed meal and hulls for wintering steers which are to be finished on pasture the following summer. The average daily gain with cotton seed for the combined winter and summer periods was 1 pound per day, or slightly smaller than for steers wintered on cowpea hay or cottonseed meal and hulls.

8. The steers which were wintered on coarse waste hay did not make as good gains on pasture nor as large daily gains for the winter and summer periods combined as the steers of the other lots which received feed.

9. The wintering of cattle by the use of feed in addition to the natural range will be both economical and profitable for cattle which are to be fattened early in the summer, but the longer the summer grazing season the less economical and profitable the previous winter feeding will have been. If the steers in the foregoing tests had been grazed until pasture gave out in October, instead of being sold in July or August, it is extremely doubtful if any difference in fatness could have been detected between the steers which wintered on range alone and those which received feeds.

ADDITIONAL COPIES
OF THIS PUBLICATION MAY BE PROCURED FROM
THE SUPERINTENDENT OF DOCUMENTS
GOVERNMENT PRINTING OFFICE
WASHINGTON, D. C.
AT
5 CENTS PER COPY

▽